

Land Management

29

Introduction

The arid climatic conditions in Central Asia dictate the types of land use, and these are:

- ▶ rangeland for grazing cattle, and
- ▶ irrigated agriculture where water is available.

Without irrigation, no agriculture with acceptable yields can take place in most parts of the region.

Irrigated agriculture is found mainly in the Fergana Valley and in the basin of the Aral Sea where, thanks to the two great rivers, the Amu-Darya and Syr-Darya, about 4.5 million hectares are irrigated, representing about half of the total irrigated area in Central Asia.

Under Soviet rule, the irrigated area in the Aral Sea basin was extended (originally in 1960 some 2.3 million hectares were under irrigation) in order to cultivate cotton. This area was to be the main

supplier of cotton for the whole of the Soviet Union. Since the Aral Sea crisis, cropping has diversified, with winter wheat becoming one of the main crops.

Both rangeland and irrigated land cultivation are over-exploited land uses that have led to a deterioration in the natural ecosystem.

Land degradation is a result of soil erosion, desertification, waterlogging and subsequent salinisation and, less obviously, a result of the reduction of organic matter in the soil. The soil organic matter content declined because of intensive cultivation and also because of deforestation.

- ▶ In the irrigated areas of Uzbekistan, for instance, the soil organic matter (OM) content declined by 30-50 per cent due to intensive land use over the last 40 years. Today, soils with poor and very poor OM content (from 0.4 to 1%) account for 40 per cent of the irrigated area. The total area with

various kinds of erosion covers 31 million hectares or 69 per cent of the country.

- ▶ In Kazakhstan 179.9m ha or 60 per cent of the republic are at present covered by land going through the desertification process.
- ▶ Even in relatively scarcely populated regions, such as the Tian-Shan the areas under forests have declined, vegetative regeneration has ceased, and progressive degradation of mountain pastures has been observed during the past 30 years.

In order to restore degraded lands, it is first necessary to identify the causes of degradation. Models have been developed that take into account the following aspects:

- ▶ water harvesting,
- ▶ agro-forestry,
- ▶ afforestation,
- ▶ people's participation, and
- ▶ bio-prospecting.

Testing of models for the Gharwal Himalayas by the GB Pant Institute for Himalayan Environment and Development, located in Srinagar, Uttar Pradesh, India, has been successful and has led to the conclusion that eco-restoration and conservation of natural resources are feasible.

Management information systems (MIS) can quantify, at any moment in time, the situation of land resources. It is a handy tool that can assist in preventing degradation of agricultural land.

On the national and international levels, plans have been developed to combat land degradation.

For example, in accordance with the UN Agenda 21 resolution, a National Strategy was developed in Kazakhstan, which provides measures for sustainable land management focussing on:

- ▶ land protection from water erosion, wind erosion, humus depletion,

swamping, and secondary salinisation;

- ▶ restoration of the fertility of arable land ranges and hay meadows and reclamation of lands disturbed by various activities;
- ▶ forest preservation and development; and
- ▶ conservation of biological diversity.

In Uzbekistan, alternative cultivation techniques have been developed to improve agriculture and replace the use of pesticides. This is done partly out of environmental concern and partly out of necessity, as pesticides are difficult to acquire, and there is no money to pay for them.

Major Issues and Experiences

THE ROLE OF MOUNTAIN TERRITORIES IN SUSTAINABLE DEVELOPMENT OF CENTRAL ASIA

Prof. I.V. Severskiy

*The Institute of Geography,
Republic of Kazakhstan*

There are many problems in the different mountain territories of Kazakhstan. Some of these originate outside the country and some within the country. Some problems have been present for a long time, while others are relatively new and have arisen with the break up of the Soviet Union and the current economic change. The main problems are anthropogenic in origin and were caused by industrial pollution, resulting in air and chemical pollution and soil damage. Other problems, such as overgrazing, are caused by mountain communities. The consequence of all these is the contamination of water supplies.

Within the borders of southern and eastern Kazakhstan, the total area of mountains above 1,000m is more than 160,000sq.km. The problems of mountain territories of Kazakhstan have always attracted the attention of scientists.

Most of the present data on the mountains of Kazakhstan were obtained through the efforts of scientists from the institutes belonging to the academies of Geography, Geology, Botany, Zoology, Soils, etc.

The Main Research Priorities

The most important research issues are as follow.

- ▶ Estimation of renewable water resources in the mountains and anthropogenic impacts on run-off
- ▶ Problems of interstate water sharing and transborder water and air pollution
- ▶ Problems of surface and groundwater interaction
- ▶ Estimation and prediction of climatically and anthropogenically caused changes in natural processes and phenomena that affect the dynamics of mountain geosystems
- ▶ Control of anthropogenic impacts (including recreation) on mountain geosystems
- ▶ Problems of natural hazards
- ▶ Socioeconomic and demographic problems in the mountains and on the adjacent plains
- ▶ Integrated monitoring of mountain territories
- ▶ Problems of geopolitics, including development of frontier lands in mountain countries

In the current condition of an economic crisis in Central Asia, it is difficult to expect adequate support for research on the above-mentioned problems. The situation is unlikely to improve greatly in the near future. In this situation, the following tasks are the most important.

- ▶ Interstate coordination for research on the problems of mountain territories, with support from international organizations
- ▶ Organization of research in comparative geography under international projects

The mountains are unique territories for the countries of Central Asia because an overwhelming part of the water resources and practically all renewable resources of fresh water in the region are formed here.

Steady degradation of mountain geosystems, decline in socioeconomic conditions, and complex demographic changes characterise the current situation in the majority of mountain areas of Central Asia.

BASIC STRATEGY FOR SUSTAINABLE DEVELOPMENT: CHINA **Liu Dong Sheng**

Chinese Academy of Sciences

In an arid region, such as Xinjiang, sustainable development of agriculture, forestry, animal husbandry, and other sectors needs to proceed with scientific assessment, detailed planning, and careful management of the fragile eco-geological system. However, to achieve these objectives, knowledge of the physical environment of the region is needed to promote awareness of the principle of coordination between the natural process and human activities.

In China, arid areas occupy the desert region and the eastern part of the Loess Plateau. The structural geological process of the region and the sedimentation processes influence the environment. Xinjiang region is not as arid as the southern part of China. However, with the uplifting of the Tibetan Plateau and the beginning of the monsoon from the southeast and southwestern parts of the oceans, the eastern part has a monsoon climate while the northern part of Xinjiang is becoming drier and drier. During the Ice Age in Europe, there was only a one degree decrease in the average temperature and this caused loss of harvests and forced people to move from north to south. The greenhouse or other effects of climate change are very important parameters in planning.

The arid regions of China are not as cold as one might expect and, in fact, during July it is higher than in other regions. Changes in the temperature in different seasons are very important for the development of agriculture. It is also important to note the average precipitation, which does not vary as much in January for the whole country as it does in July. The east receives a lot of rain in July. Runoff is also very important. The annual runoff in the western arid region does not differ greatly from that in the east, but it is important to examine the seasonal differences.

If the temperature drops by five degrees or the precipitation increases by 10 per cent, then striking differences in vegetation between the arid and other regions can be observed. Natural hazards, such as hailstorms (including cold air currents), also have to be considered. In China there is a big difference between the farmlands of the northeast and southwest. Ninety-five per cent of the people live in the eastern part and only five per cent in the west. This should also be considered in any planning exercise for the region.

Industrial development in China also demonstrates sharp contrasts from the east to the south. Planners and decision-makers have to take into account not only the natural background but also the socioeconomic characteristics of the region for any type of strategic development in Central Asia.

**SUSTAINING THE RANGELAND OF
CENTRAL ASIA - A GLOBAL
PERSPECTIVE**
Cees de Haan

The World Bank, Washington D.C.

The transition to a market economy in Central Asia offers an opportunity to establish sustainable pastoral production (the complex of range, animals and human, and rangelands) in the region, but it could also lead to land degradation.

A number of significant emerging trends in the pastoral sector in Central Asia has been identified and, based on experience elsewhere, some alternative ways of addressing these trends can be identified. The focus is on the four criteria for sustainable pastoral production as the organizing principle. They are elaborated upon below.

Ecological Soundness

It is recommended that, while introducing appropriate land tenure policies and improvements in marketing, the characteristics of the customary pastoral system that are ecologically sound should be maintained and strengthened. This includes herd and flock mobility and continued access to those resources of critical importance to the system (water, summer or winter meadows).

Economic Viability

Emphasis should be on adopting policies that favour market-based pricing for inputs and products, equitable taxation of the pastoral sector, diversification of range production, and, under most conditions, the creation of alternative employment outside the pastoral sector.

Social Acceptability

It is suggested that there should be strong participation of the target population in decision-making about range policies and improvements; and that implementation should be decentralized.

Political Support

A strong argument should be made for the establishment of regional and national pastoral associations to give support to a policy framework for sustainable rangeland use.

The World Bank is funding pastoral development in several parts of the world along these lines.

**STAKEHOLDERS IN SUSTAINABLE LAND
MANAGEMENT**

Prof. Chen Guangwei

Chinese Academy of Sciences

Who is responsible for land degradation? Who is responsible for sustainable land management (SLM)? It is, after all, a set of people. One should first and foremost understand the concept of sustainable land management. SLM is an important topic in the world, and more so for China. SLM is the kind of land management that maintains the services and quality of the environment at the same time. As a goal and vision, SLM is closely linked to sustainable development. A set of indicators serves to define the components of SLM: land productivity, security, protection, viability, and acceptability.

The key problems threatening SLM are: land degradation, availability of water, pollution, and loss of biodiversity. SLM can be practised at different levels: national, regional project, community, and household. Multi-level stakeholders have different interests, influence, power, and risks in decision-making for SLM. There is a multi-dimensional perspective and approach to SLM in China.

China's land resources consist of:

- ▶ a fairly large area with 9.60 million square kilometres,
- ▶ three great areas: lowland and hills, plateaus and basins, and the roof of the world,
- ▶ overlapping tropical, sub-tropical, warm temperate, temperate, and cool temperate zones and the Tibetan-Qinghai Plateau.

Key Problems

Seven per cent of the world's farmland feeds 22 per cent of the world's population. Yet the question remains. Who will feed China? Land ownership/land use rights should be reformed. Soil erosion is a critical problem in China. About 1.83

million sq.km. are subject to soil erosion. Five billion tonnes of soil are washed away each year. The most severely affected areas are the Yellow River basin and the Yangtze River basin. Another problem is desertification. About 2.62 million sq.km. are suffering from desertification. The most severely affected areas are the western-most part of China and the area along the Great Wall on the north.

Over-grazing, over-cutting, and over-harvesting also pose serious problems. Over-grazing is common on grasslands, and there is over-harvesting of medicinal herbs and over-cutting of fuelwood. The forest cover has decreased from 30 to 40 per cent in the upper reaches of the Yangtze River. Pollution is another major problem, 50 per cent of the large rivers are polluted and solid waste and waste water are not properly treated in the cities. Land pollution, due to over-use of chemicals, has degraded the quality of productive land. Urbanisation occupies a vast area of farm land and about 330,000ha of farm land are converted to non-agricultural uses each year. China has 270 billion cubic metres of water, but there is a water shortage in the west and northwestern parts of China. In addition, there is increasing population pressure. Thirteen million people are added each year at the rate of one per cent. By 2050 AD, China's population may reach 1,600 million.

Taking all of the above into consideration, it is of paramount importance to call all the stakeholders to participate in sustainable land management in China. In order to do so, it is important to identify stakeholders, mobilise them for participation, and define the role of each so that there is an understanding of the complexity of sustainable land management and sustainable development. Stakeholders should learn to communicate and develop bargaining skills for negotiations, compromise, and to resolve conflicts.

Clearly the government should also play an important role, not only as a stakeholder, but also as a facilitator of the entire process.

By actively participating in SLM, the stakeholders will be participating in decision-making processes for overall sustainable development.

**LAND USE AND IMPROVEMENT OF
NATURAL PASTURES IN KYRGHYZSTAN**
Dr. Dzholdoshev K.D.

Kyrgyzstan

The Republic of Kyrgyzstan is a mountainous country. Eighty-seven per cent of its agricultural land is natural mountain pastures. Therefore, the ecological situation of the country depends to a great extent on the condition of these pastures. There are 8.5 million ha of natural pasture and 234 thousand ha of hay meadows. The natural fodder base is mainly located between altitudes of 600 to 4,000masl. There are high mountain pastures (2,600-4,000m) with a total area of 4.1 million ha. Among the high mountain pastures 1,9 millionha are at altitudes between 3,000–4,000masl. Natural pastures are very diverse. One can classify them according to their botanical diversity, their productivity, and their fodder value as well as their soil and climatic conditions and altitude.

The most common types of pasture in the desert and semi-desert areas are *Artemisia*-steppe and in steppe areas *Stipa* and *Festuca*-steppes. One can divide pastures and hay meadows according to their vegetation; viz, into deserts, semi-deserts, steppe, grass-steppe, and grassland (long grass, subalpine, alpine). There are 3.1m ha of steppe, 2.4m ha of grass-steppe, 1.3m ha of grassland pastures, 1.4m ha desert pastures, and a small area of high mountain tundra (0.15m ha). By seasonal use there are: spring - autumn pastures (2.7m ha -

30%), summer pastures (3.6m ha - 44%), and winter pastures (23m ha - 26%). Currently the productivity of the summer pastures is 5.7 dt/ha from, 3.9 dt/ha in spring - autumn pastures, and 2.3 dt/ha in winter pastures.

The excessive pressure from livestock during the past and the unsystematic use of pasture have led to a sudden decrease in the productivity of pastures. More than one-third of the pasture area has weeds with bushes growing and 1.7m ha are degraded, of which 170 thousand ha are seriously degraded. The ecological balance has been disturbed on most of the pasture land. To improve the situation in the mountainous areas of the Republic, a programme to improve the pasture lands and meadows by killing the weeds and bushes, controlling the use of mineral fertilizer, optimising land use, and introducing irrigation has been developed.

The evaluation of experimental data shows that the right time to use the pastures is when the livestock are able to use the biomass. In Kyrgyzstan this is about 25 to 35 days after the snow has melted or 18 to 20 days after the beginning of the vegetation period. During that time the pasture vegetation has a very high feed value (share of protein to 11-12%). The coefficient of usage for grass-steppe is 58 per cent in the beginning of June, 42 per cent in the middle of July, and, at the end of July, only 36 per cent. Not less important is the determination of the grazing period. Research has shown that desert pasture, steppe pasture, and grassland pasture can only be used once during the vegetation period, while double usage causes degradation and decrease of productivity in following years. It is possible to use subalpine and alpine pastures twice a year. Pastures in Kyrgyzstan have very severe weed problems. In grasslands and grass-steppe pastures there may be a 70-90 per cent coverage by weeds such as *Caragana*. Scientists

have tested herbicides to destroy all these weeds.

Because of the declining number of livestock, especially sheep, and the small size of privatised farms, there is little usage of summer pastures. This could lead to an improvement in pasture conditions, but this has not taken place. Weeds grow faster than fodder plants.

In areas close to settlements, the worst conditions prevail on the spring-autumn pastures. This is because the number of livestock is six to seven times higher than the limit. The process of degradation is continuing. The declining ecological situation hastens desertification. Researchers from Kyrgyzstan have successfully carried out many improvements on the fodder value of pastures by using various species (such as *Agropyron* and others) adapted to arid climates.

There are about 100 thousand ha of pasture land in Kyrgyzstan. These can be irrigated (at an altitude of 2,000-2,500masl) in the winter pasture zone in the valleys of Kara-Kudzhur, Alaj, Arpa, Tonskije, and Dzhety-Oguzskije syrty. In these high mountain valleys, a non-profitable barley crop pattern prevailed. The performance was very poor. Wind and water-based soil erosion persisted. Scientists have found other methods of irrigating meadows through which the productivity would be between 50 and 60 dt/ha of high protein hay. However, these methods have not been implemented yet.

DESERTIFICATION AND REHABILITATIVE STRATEGIES IN CHINA
Ci Longjun

*National Bureau to Combat Desertification
China*

In 1994 'The United Nations Convention to Combat Desertification in Serious Drought Occurred and/or Desertified Countries, especially in Af-

rica' (hereafter simplified as 'CCD') provided 'Desertification' with a clearer definition:

"desertification indicates land degradation and an arid, semi-arid, and dry sub-humid areas caused by many factors including climate change and human activities. 'Land degradation' indicates reduction of biological or economic(al) [sic] productivity and complexity or loss of rain-fed land, water-irrigated land, rangeland, pastureland, forest, and woodland in arid, semi-arid, and dry sub-humid areas due to land utilisation or one force or several forces combined. These include: (1) wind erosion and water erosion causing soil material loss, (2) deterioration in soil physical, chemical and biological characteristics or economical characteristics, and (3) long-term loss of natural vegetation'. 'Arid, semi-arid and dry sub-humid indicate areas in which the difference between annual precipitation and potential evapotranspiration is in the range of 0.05 to 0.65, and polar and sub-polar areas are excluded."

Based on information from the UN, desertification has already had impacts on one-fifth of the world population and one-third of the earth. Desertification has brought serious catastrophes to the global environment and people's lives in many developing countries. It has become an important factor behind poverty and is hindering economic and social development.

China is one country that has been seriously affected by desertification. In NW China, the northern part of Central-North China, and the west of NE China, there are large areas of arid, semi-arid, and sub-humid arid regions. The environment is extremely fragile. Under the increasing population pressure, land desertification is becoming severer and causes serious damage to the local environment and the socioeconomic development of the local people.

The Chinese people have a long history of combatting desertification, and the central government has attached great importance to combatting desertification since the early 1950s.

However, a large-scale project to combat desertification, began at the beginning of the 1990s covering the whole country. In 1991 and 1993, the State Council convened the Lanzhou and Chifeng conferences on preventing and combatting desertification. After the Lanzhou conference, the State Council approved '1991-2000 National Combatting Desertification Overall Planning Key Outlines' [sic]. These tried to integrate prevention of desertification into national economic and social development planning. Later, the Ministry of Forestry compiled the '1990-2000 National Combatting Desertification Project Overall Planning' [sic] based on 'Overall Planning Key Outlines'. In 1994, the central government authorised the Ministry of Forestry to take charge of combatting desertification and of setting up the China Coordinating Group to Combat Desertification. To improve capabilities to overcome desertification, the China Desertification Monitoring Centre, China Training Centre to Combat Desertification, and China Research and Development Centre to Combat Desertification were established in 1994. Since the seventh five-year plan, science and technology projects to tackle key problems related to desertification have been carried out. The government has already placed it in the ninth five-year plan period and listed it in the National Scientific Research Plan.

Through the joint efforts of all related institutions, the rehabilitation of desertified land in China has been incorporated into the National Social and Economic Development Plan. In desertified areas, rehabilitation of vegetation, rangeland construction, and soil conservation have progressed con-

siderably. Many practical techniques and experiences, as well as models of development and management, have been developed. These include biological fixation of shifting sands, planting sand along railways, arable land construction through flattening dunes through flooding, planting trees and grass by aerial seeding on sandy land, rice cultivation on sand dunes, integrated management of small watersheds, rational rotation grazing, and livestock industry based on grass yields. Artificial oases have been created in arid and semi-arid areas. Today, in the marginal areas, sand dunes have been stabilised and more crop farming activities have developed. The regional eco-environment is improving in many areas'. Socioeconomic development is taking place and local people's living standards have been raised.

LAND AND WATER RESOURCES IN THE INDIAN HIMALAYAS: ISSUES OF DEVELOPMENT, USES, SUSTAINABILITY AND PEOPLES' DIMENSION

T. N. Dhar

*President, SHERPA
India*

Everyone in India talks about the deteriorating environmental and development situation in its Himalayan regions. The Himalayas comprise nearly one-fifth of the total geographical area of India. These hill regions have steep climatic gradients varying from sub-tropical to arctic and ranging from 300 to 8,000m. Most of the hill populations depend on primary occupations such as agriculture, animal husbandry, horticulture, plantation crops, vegetable growing, floriculture, and extraction of forest produce. More than four-fifths of the work force are engaged in primary occupations. The secondary and tertiary economic activities are rather limited. In recent years, however, the development of tertiary services, such as transportation, tourism, and so on, has been somewhat marked.

More than 40 million people live in this region. Around one-eighth of the land is under some form of agriculture, and it is mostly rainfed. As a result of increasing human and animal pressures agriculture has been extended on to steep slopes. The quality of forest cover and pasture land has deteriorated. There is an acute fodder shortage. Productivity levels, except in some foothill areas (called the *Terai*), are very low. The water regimes are under stress. Bio-diversity is under assault and many other negative socioeconomic and political impacts are visible.

Most of the impacts have been adverse as a result of unplanned land and water use, cultivation on steep slopes, deforestation, encroachment on to forest lands, badly implemented engineering activities (e.g., construction of roads, dams, canals), very poor maintenance of village/community forests, cutting down of broad-leaved plant species, inappropriate agronomic practices, shifting cultivation, environmentally hostile tourism, and forest monocultures. In biological terms there is reduced biodiversity and many species of plants and animals have either become extinct or are on the verge of becoming so. Socioeconomically hill populations are poor, some are even isolated. Their nutrition levels are low and they suffer from many endemic diseases. The situation of women is particularly affected.

Most of the land in the hills has no irrigation facilities. For more than three-fourths of the land under cultivation, rainfed agriculture is practised. The possibility of bringing substantial areas under additional irrigation are by no means promising. A little over one-tenth of the geographical area in the Himalayan regions is under cultivation. Barring some exceptions, and excluding cultivation in the *Terai* areas, productivity is quite low.

In the Himalayan states, livestock are an essential and important component

of overall land use. They are central to agricultural development and land fertility. The number of cattle, buffaloes, sheep, goats, and pigs is over 20 million; and the dominant category is cattle, mostly maintained for draught power, meat, milk, wool, and hides. Genetically the livestock are of very poor quality and they face widespread nutritional shortages and imbalance.

Shifting cultivation is practised mostly in the North-Eastern Himalayan states where it is a big problem. It is reported that alternative land uses, such as pasture development, horticulture, introduction of cash crops, and other similar programmes, have started making an impact in recent years. As a result of this, areas under shifting agriculture have decreased slowly but perceptibly. Slash-and-burn is a traditional farming system. It used to provide a basis for subsistence farming, maintenance of cultural values, and social stability when population densities were low.

The most important rivers in northern India emerge from the Himalayas and have very large basins. Yet, it is a fact that, because of the seasonality of precipitation and inadequate water storage capacities, most of the river waters flow down to the plains and then to the sea. Only a small amount of the water available is harnessed for productive and consumption purposes. Management of that water has to be an important focus of any protective and regenerative strategy in the mountain regions where water and soil are interlinked. Any successful planning should ensure optimal percolation and sub-surface flow with a view to recharging groundwater and reactivising springs and water sources: only in this way will year round supplies be ensured.

The core strategy should be a combination of protection, regeneration, and production. This can be achieved by adopting an integrated watershed management approach incorporating micro-

planning, integrating resource use, and facilitating decisions by local communities.

Land and water uses and natural resource management in hill areas need change. Changes are difficult to bring about. The problems are lack of education, of persuasion, of mobilisation, and of compensatory actions when changes involve loss of income or curtailment of resources. Mobilisation of people involves organizing communities for planned action. It implies holistic and coordinated approaches to development in which communities initiate, through internal and external stimuli, and take part in the process of development.

The ecological and economic health of the Himalayan States of India is important, not only for the region itself but also for the vast Indo-Gangetic plains below that constitute the granaries of the country and which can generate surpluses for other countries as well. These fertile plains receive water and soils from the great range of mountains above. This hill-plains' interdependence means environmentally-friendly, people-responsive sustainable development in the Himalayan regions of India is of the utmost importance. Economic growth and diversification are needed in the mountains. The ecological foundations essential for sustainable advances in land and water conservation; in crop, animal, and biomass production and productivity; and in off-farm employment and human resource development will need to be secured in every way possible. This implies adequate resource allocation at the state and national levels and substantial international cooperation and assistance.

Conclusions

Much remains to be done. Environmental awareness is growing everywhere, albeit more at the non-government than

at the government level; often because governments have other priorities. Given the similarity of problems, it would be a good idea for the region to cooperate in combatting the problems. An Interstate Council should be set up similar to the one established in 1992 by the five CIS countries in Central Asia to tackle the Aral Sea crisis. Such an Interstate Council could develop a joint programme to attract funds from international financing agencies.

The programme should be based on a proper up-to-date inventory of soils in the region. Given the two principal land uses, the programme should focus on stock farming and irrigated agriculture. In the case of stock farming, overexploitation of grazing areas should be controlled by reducing the number of cattle, so that the ecological balance is restored.

In the case of irrigation, efficient water use is essential to control waterlogging and the resulting salinisation of soils. The use of agro-chemicals should be reduced to the minimum and be replaced by alternative cultivation techniques.

The presentation dealing with land management and the discussions that followed raised the following points.

Need for Inter-state Cooperation

There were many common problems concerning transboundary implications in sustainable management of land resources. The historic regional cooperation demonstrated in managing the Aral Sea crisis has now to be replicated by similar inter-state bodies for the management of fragile land resources in the region. While each country should undertake appropriate measures within its boundaries, because of the close environmental relationships, countries should work together to develop sustainable solutions.

Prioritisation

Because of the economic transition and the difficulties being encountered, governments did not always give adequate priority to sustainable management of land resources. The emphasis was still on exploitation of available land in spite of the problems experienced in the past.

Increased Awareness and Understanding of Land-related Problems

Local inhabitants did not readily understand the need for conservation and sustainable use of land resources. Once there was better understanding of the reasons, cooperation from the people was also stronger. Problems caused by misuse of irrigation, water logging, salinisation of soils, and soil pollution from agrochemicals were aspects requiring better understanding than herebefore.

Scientific information in the region was generally much better than in other areas. Yet organizations responsible for such information were facing problems in terms of support. Recent changes in the conditions of the land resources needed careful monitoring, a comprehensive inventory for soils was essential, transboundary pollution of water and therefore of soils needed monitoring, and many other problems needed new research initiatives.

Climate Change and Land Use

It was generally believed that the region's climate was changing, but its overall direction and the factors behind the change needed further investigation. The impact of wind erosion and larger volumes of sand in the air required close study. The implications of changing climates on oases and limited agricultural land could be far reaching.

Documentation, Testing and Replication of Innovative Technologies and Practices

The countries in the region were already developing many innovative technologies and practices in different aspects of land resource management dealing with crops, soil conservation, desertification control, efficient use of water resources, and many other areas. Many of these were known only to the specific projects developing them. Countries could benefit immensely from sharing this information with each other.

Customary Practices and Indigenous Knowledge

Many customary practices are not only environmentally friendly but also make efficient use of locally-available resources. In many areas, such knowledge is disappearing rapidly and efforts must be made to document them and explore their continued use by the community.

Sustainable Land Management

Sustainable land management; as a principle of well-defined practices focussing on productivity, security, viability, protection, and acceptability; needs to be promoted in the region. The roles of different stakeholders need to be properly understood and identified. A decentralized approach is a necessary precondition for successful implementation of sustainable land management. Ecological soundness, economic viability, social acceptability, and political support need to be integrated to find sustainable solutions.

Adequate Funding

Because of the many challenges in the management of land resources in the region, adequate funding is a crucial prerequisite to adopting sustainable land management practices. The economic

crisis in the region makes it very important that outside support is available to

organize and undertake the different measures needed.